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Effectiveness of the Bern Ambulatory Interprofessional Rehabilitation (BAI-Reha) programme for patients with chronic musculoskeletal pain: a cohort study

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Summary

QUESTIONS UNDER STUDY: Chronic pain has a high impact on individuals and society. (Cost-)effective interventions are desperately needed. We evaluated short- and long-term effects of the Bern Ambulatory Interprofessional Rehabilitation (BAI-Reha) for patients with chronic musculoskeletal pain.

METHODS: We analysed data prospectively collected from patients with chronic musculoskeletal pain before and after BAI-Reha (at 12 weeks, 1 year and 2 years) using linear mixed-models and logistic generalised estimating equations.

RESULTS: The first thirty consecutive patients with chronic musculoskeletal pain, aged between 20 and 73 years (mean 44.83, standard deviation 12.57 years) were included. We found significant changes over time compared with baseline for return to work ($p < 0.001$), Euro quality of life visual analogue scale score ($p = 0.026$), burden of suffering ($p = 0.001$), self-rated and observed quality of daily life task motor performance ($p < 0.001$ and $p = 0.012$, respectively) but not for pain intensity ($p = 0.16$) and observed quality of daily life task process performance ($p = 0.28$). At the first postintervention visit we found significant differences compared with baseline in return to work (odds ratio 5.26, 95% confidence interval [CI] 1.80–15.39], burden of suffering (mean difference 5.26, 95% CI 2.09–8.44], self-rated quality (mean difference 2.31, 95% CI 1.57–3.05) and satisfaction (mean difference 2.80, 95% CI 1.95-3.66) with daily life task performance, and observed quality with daily life task motor performance (mean difference 0.31, 95% CI 0.02–0.60).

CONCLUSIONS: This study confirms earlier data and supports the effectiveness of interprofessional rehabilitation for patients with chronic musculoskeletal pain.

Key words: *musculoskeletal rehabilitation, ambulatory, interdisciplinary, multiprofessional, biopsychosocial*

Introduction

Chronic pain has a high impact on individuals, their families, employers and society. In Switzerland, it is estimated that low back pain leads to direct health care costs of CHF 3.8 billion (EUR 3.5 billion) and indirect costs of CHF 7.4 billion (EUR 6.8 billion) per year [1]. In addition to the financial aspects, the chronification of pain has a fundamental impact on work [2], social relations [3] and performance of activities of daily living (ADL) [4].

The range of treatment modalities for patients with chronic pain is wide. It includes drugs, single interventions such as information, education, physio- and occupational therapy, surgical procedures and placebo therapies, and also interprofessional/interdisciplinary rehabilitation programmes [5]. Within the last decade several randomised controlled trials have shown that interprofessional interventions are more effective than single interventions in patients suffering from chronic pain and diagnosed with ankylosing spondylitis [6], back and neck pain [7], fibromyalgia [8–11], low back pain [12–16] or migraine [17]. However, according to a recent Cochrane review the intervention effect in these trials is moderate [18].

There are inherent problems in designing randomised controlled trials for chronic musculoskeletal pain. As the time-curve of return to work decreases exponentially, it may be considered unethical to run a control group over a period of more than 6 months with no interventions at all or with interventions proven to be of little effect. In addition, the contribution of the well-defined variables promoting chronification vary from patient to patient. Thus, very large patient numbers would be necessary to generate reliable data. Costs of such large randomised controlled trials are not covered by pharmaceutical companies. As an alternative approach, cohort studies with a wide range of outcome variables allow evaluation of the effectiveness of well-defined rehabilitation programmes over time [19].

We decided to analyse the short-, medium- and long-term effects on the first thirty patients participating in our ambulatory rehabilitation programme, the Bern Ambulatory Interprofessional Rehabilitation (BAI-Reha). The data were extracted from a range of predefined assessments and clinical variables. We calculated the effects on return to work, pain intensity, quality of life, burden of suffering, self-rated and observed quality of and satisfaction with daily life task performance.

Methods

Design

This was a cohort study. Data were extracted from patient records at the University Hospital of Bern. Patients started the BAI-Reha programme between March and November 2013 and were followed-up in a standardised fashion using validated assessment tools, until November 2015. The use of anonymised data for this study was approved by the Ethics Review Board Bern (121/15).

Participants

Patients admitted for participation in the BAI-Reha programme were assessed in an in-patient setting for 48 hours. Physicians, nurses, occupational and physiotherapists, psychologists and social workers used validated tools in a standardised work-up. Based on the results, the team judged conjointly whether the patients should be included in the BAI-Reha programme or whether other treatment/rehabilitation modalities were more suitable. The patients were thoroughly informed and included in the programme only if they showed genuine motivation and agreed to perform the whole programme. (Information leaflets about the programme can be downloaded from our website www.rheumabern.ch). Criteria for inclusion were: (1) age between 18 and 75 years; (2) diagnosis of chronic musculoskeletal pain syndrome according to ICD-10 criteria [20] with chronic pain either (a) associated with actual or potential tissue damage or (b) associated with tissue damage and a mental disorder; (3) indicators of significant impairment in psychosocial functions; (4) dominance of somatic disease aspects over psychological/psychiatric problems such as depression; (5) obvious interest of the patient; and (6) rehabilitation potential. The exclusion criteria were: (1) a primary mental disorder, (2) refusal to participate in an interprofessional outpatient rehabilitation, (3) limited skills to actively participate in group discussions held in German, and (4) involvement in ongoing legal proceedings about health insurance benefits.

Setting, staff and location

The study took place in Switzerland at the Department of Rheumatology, Immunology and Allergology of the University Hospital Bern. This department provides interprofessional inpatient and outpatient medical and rehabilitation services for patients with various diagnoses, including patients with chronic musculoskeletal pain. All interprofessional interventions but one were implemented in the ambulant setting of the department. The work place visits and interventions were conducted at patients' regular work places.

Interventions

The BAI-Reha programme is a complex interprofessional intervention lasting 12 weeks (table 1). It consists of three phases of 4 weeks each. It was developed on the basis of evidence and international guidelines, and includes single and group interventions and independent self-directed exercises. The goals are defined at start by the team together with the participant and they are readjusted monthly during the course of rehabilitation with congruent modifications of the interventions. For example, if a client aims at working again, at the beginning the interventions focus on body awareness and ergonomic postures; after resuming part-time work, the focus is adjusted to pause management and releasing postures as well as physical reconditioning. During the first 4 weeks, patients are requested not to engage in co-interventions. Afterwards, they continue with independent self-directed exercises.

Table 1: Content of interprofessional intervention in BAI-Reha phases one to three: description and intensity of interventions.

	Description of interventions	Total duration (h)
Phase one: 1st week to 4th week	**Individual interventions**	
	Medical treatment	4
	Occupational therapy	4
	Physical therapy	4
	Behavioural therapy	4
	Social worker's intervention	4
	Interprofessional meetings	2
	Group interventions	
	Group exercises	10
	Behavioural therapy group intervention	6
	Occupational therapy groups (e.g., cooking)	12
	Body-awareness group	4
	Swimming	4
	Nordic walking	4
	Total hours of interprofessional intervention	**62**
Phase two: 5th week to 8th week	**Individual interventions**	
	Specific individual interventions based on the individual needs of participants: medical treatment, occupational, physical and/or behavioural therapy	12
	Workplace visit and intervention	4
	Group interventions	
	Group exercises	10
	Supervision of independent self-directed exercises	2
	Independent self-directed exercises*	14
	Total hours of interprofessional intervention	**28**
Phase three: 9th week to 12th week	**Individual interventions**	
	Specific individual interventions based on the individual needs of participants: medical treatment, occupational, physical and/or behavioural therapy	5
	Interprofessional meetings	1
	Group intervention	
	Group exercises	10
	Independent self-directed exercises	14
	Supervision of the independent self-directed exercises	2
	Total hours of interprofessional intervention	**18**
All phases	**Total hours of interprofessional intervention**	**108**

* The hours needed for independent self-directed exercises are not calculated as part of the total hours of interprofessional interventions.

Phase one consists of 20 hours of single interventions and 40 hours of group interventions. The aim of this phase is to acquire fundamental information about pain, to learn strategies and acquire competences in order to cope with the pain and increase activity and participation in different areas of life, and to increase physical condition. The participants are usually on sick leave during this phase.

Phase two is characterised by consolidation of strategies and increasing competence of participants. The time for interprofessional interventions is decreased and the time for independent self-directed exercises is increased. The self-directed exercises are developed together with the patients in relation to their individual goals and are recorded in the patient's own words in an individual training book. So-called activity-pacing (e.g., walking through the woods or household activities like ironing or hoovering) is a method often used in occupational therapy. A common method in physiotherapy is re-establishment of muscular balance by stretching a tense antagonist (e.g., the descending part of the trapezius muscle), while activating a weak agonist (e.g., the ascending part of the muscle). In phase two the participants who are employed gradually start work training at their regular workplace. An occupational therapist assesses the worksite, holds discussions with the employers and recommends work adaptations (e.g., adaptation of workplace, work tasks and ergonomics).

Phase three is characterised by increased competences of participants to cope with the pain in daily life. They receive 2 to 5 hours of specific individual interventions (if needed) and 10 hours group interventions during these 4 weeks. They are encouraged to continue their independent self-directed exercises, to establish long-term physical training and to increase their work participation.

Outcomes

The primary outcome was return to work as this is the most important health-economic and integrative measure [18].

Secondary outcomes were the EuroQoL-5D-3L VAS (European Quality of Life and Health measure) [21, 22], the Numeric Rating Scale (NRS) [23], the Assessment of Motor and Process Skills (AMPS) [24], the Canadian Occupational Performance Measure (COPM) [25], and the

Pictorial Representation of Illness and Self Measure (PRISM) [26].

The EuroQoL is a standardised outcome measure of quality of life and health status for clinical and economical appraisal [21]. It provides a descriptive profile and a visual analogue scale (EuroQoL VAS) for a person's health status, including those with chronic pain [27]. The NRS (Numeric Rating Scale) is an 11-point scale from 0–10, 0 standing for no pain and 10 standing for the most intense pain imaginable [23]. Patients select a value corresponds to the intensity of their current pain. The AMPS is an internationally standardised, observational assessment of the quality of activities of daily living (ADL) motor and ADL process task performance [24, 28]. There is extensive evidence to support the reliability and validity of the AMPS measures, including validity for use with patients with chronic pain [e.g., 4]. The COPM [25] is a semi - structured interview used to evaluate participants' perception of quality and satisfactoriness of task performance over time [25]. The PRISM is a tool used to graphically represent the burden of an illness in relation to oneself and one's life measured with the Self-Illness-Separation (SIS) instrument [26, 29, 30]. All outcome measures were administered at baseline, at 12 weeks from baseline (post-treatment), and at 1 and 2 years by the team who provided the interventions during the BAI-Reha programme.

Sample size

We decided to evaluate the programme using data from the first 30 consecutive participants enrolled in the first seven groups of the BAI-Reha programme and having been followed over 2 years.

Statistical methods

Demographic data of participants was analysed with descriptive statistical methods.

Continuous endpoints were analysed using linear mixed models with time-point as fixed covariate and a random intercept and slope for each patient. Models were fitted with restricted maximum likelihood (REML) and the Satterthwaite approximation was used to calculate the degrees of freedom. Results are presented as a mean difference from baseline at each time-point with 95% confidence interval (CI) and a p-value for the overall effect of time (from a joint test of the main effects of time). The binary endpoint (return to work) was fitted with logistic generalised estimating equations (GEE) with an unstructured correlation matrix. The results are presented as odds ratio (OR) compared with baseline with a 95% CI and a p-value for the overall effect of time (from a joint test of the main effects of time), which is reported in table 3.

The statistical analyses were planned and implemented by a researcher and a clinical statistician who were not otherwise involved in the BAI-Reha programme. All statistical analyses were done with Stata version 14 (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.). A level of significance of $\alpha = 0.05$ was assumed.

Table 2: Demographic characteristics of the 30 participants.

	n	%
Gender		
Female	13	(43)
Male	17	(57)
Diagnosis		
Gonarthrosis	1	(3.3)
Arthrosis, primary	1	(3.3)
Pain in joint	3	(10)
Ankylosing spondylitis	2	(6.6)
Cervicobrachial syndrome	4	(13)
Low back pain	17	(56)
Gluteal tendinitis	1	(3.3)
Other soft tissue disorders	1	(3.3)
Language preference		
German	25	(83)
Other	5	(17)
Educational level completed		
Primary education	0	(0)
Lower secondary education*	10	(33)
Upper secondary education*	20	(67)
Post-secondary education*	0	(0)
Tertiary education*	0	(0)
Living situation		
Single	17	(56.7)
Partner and/or family	13	(43.3)
Total	30	(100)

* Educational levels are based on International Standard Classification of Education (ISCED 2011) levels of education [31]

Results

A total of 30 patients with chronic pain, between the ages of 20 and 73 years (mean 44.83, standard deviation [SD] 12.57 years) participated in this study (demographic data of participants are summarised in table 2).

Logistic GEE and linear mixed model analysis revealed a significant change for return to work (p <0.001), EuroQoL VAS (p = 0.026), burden of suffering due to chronic pain (PRISM, p = 0.001), self-rated quality and satisfaction with daily life performance (COPM performance, p <0.001 and COPM satisfaction, p <0.001) and observed quality of daily life task motor performance (AMPS ADL motor, p <0.001). No significant time effects over 2 years were found for pain intensity (p = 0.16) and observed quality of daily life task process performance (AMPS ADL process p = 0.28) (table 3). At the first postintervention visit we found significant differences compared with baseline in return to work (OR 5.26, 95% CI 1.80–15.39], burden of suffering (OR5.26, 95% CI 2.09–8.44], self-rated quality (OR 2.31, 95% CI 1.57-3.05] and satisfaction (2.80, 95% CI 1.95–3.66) with daily life task performance, and observed quality with daily life task motor performance (OR 0.31, 95% CI 0.02–0.60] (table 3). Similar effects were found at the 1-year and 2-year follow-up visits.

Table 3: Mean differences or odds ratio compared with baseline at each time point with 95% confidence interval and p-value for the overall effect on time.

	No. of patients	Mean (SD) or n (%)	Mean difference or odds ratio (95% CI)	p-value†
Return to work*				<0.001
Baseline	27	4 (15%)	1 (Ref)	
Post-treatment	26	12 (46%)	5.26 (1.80 to 15.39)	
1-year follow-up	26	14 (54%)	7.09 (2.33 to 21.56)	
2-year follow-up	26	17 (65%)	11.4 (3.5 to 36.9)	
Qol VAS				0.026
Baseline	24	48.8 (17.8)	0 (Ref)	
Post-treatment	23	58.3 (17.5)	9.00 (-0.47 to 18.47)	
1-year follow-up	21	54.2 (21.4)	4.15 (-5.84 to 14.14)	
2-year follow-up	24	63.1 (16.5)	14.3 (4.1 to 24.5)	
PRISM				0.001
Baseline	23	4.97 (2.61)	0 (Ref)	
Post-treatment	22	10.3 (7.8)	5.26 (2.09 to 8.44)	
1-year follow-up	24	11.2 (7.6)	6.26 (2.79 to 9.73)	
2-year follow-up	20	11.5 (8.2)	6.06 (1.81 to 10.31)	
COPM performance				<0.001
Baseline	30	3.32 (1.29)	0 (Ref)	
Post-treatment	26	5.63 (1.94)	2.31 (1.57 to 3.05)	
1-year follow-up	26	6.19 (1.80)	2.74 (1.89 to 3.59)	
2-year follow-up	21	6.08 (2.23)	2.74 (1.66 to 3.82)	
COPM satisfaction				<0.001
Baseline	30	2.68 (1.48)	0 (Ref)	
Post-treatment	26	5.52 (2.25)	2.80 (1.95 to 3.66)	
1-year follow-up	26	6.18 (2.23)	3.38 (2.42 to 4.34)	
2-year follow-up	21	6.32 (2.39)	3.61 (2.40 to 4.82)	
Pain intensity				0.16
Baseline	29	4.90 (2.47)	0 (Ref)	
Post-treatment	19	5.11 (2.47)	0.38 (-0.70 to 1.46)	
1-year follow-up	26	5.08 (2.15)	0.26 (-0.71 to 1.23)	
2-year follow-up	27	4.26 (2.33)	-0.69 (-1.66 to 0.27)	
AMPS ADL motor				0.012
Baseline	25	1.92 (0.36)	0 (Ref)	
Post-treatment	24	2.24 (0.71)	0.31 (0.02 to 0.60)	
1-year follow-up	20	2.37 (0.55)	0.49 (0.14 to 0.83)	
AMPS ADL process				0.28
Baseline	25	1.25 (0.23)	0 (Ref)	
Post-treatment	23	1.33 (0.26)	0.08 (-0.07 to 0.23)	
1-year follow-up	19	1.38 (0.32)	0.13 (-0.04 to 0.29)	

ADL = activities of daily life; AMPS = Assessment of Motor and Process Skills; CI = confidence interval; COPM = Canadian Occupational Performance Measure; PRISM = Pictorial Representation of Illness and Self Measure; Qol = quality of life; Ref = reference; SD = standard deviation; VAS = visual analogue scale

* Binary variable, effect presented as odds ratio

† Overall p-value for an effect of time

Discussion

The aim of this cohort study was to evaluate the short-, medium- and long-term effectiveness of the BAI-Reha programme, which is designed for patients with chronic musculoskeletal pain. The results revealed that the BAI-Reha programme, lasting for 12 weeks was effective and that the effects remained stable in all but two outcomes for 2 years.

The effect on return to work constantly increased after finishing the BAI-Reha up to the 2-year follow-up evaluation. More specifically, at baseline only 4 of 27 patients (15%) were integrated in regular work, post-treatment 12 of 26 (46%) and at the 2-year follow-up 17 of 26 (65%). We assume that the workplace interventions, involving direct contact with the employer and negotiations about ergonomic workplace adaptations, as well as the slow return to work (e.g., constantly increasing working hours) was relevant for the significant progress in return to work. Our results are in line with the results of a recent Cochrane review by Hoving and colleagues, who found that job loss prevention interventions are potentially effective in reducing job loss and work absenteeism and improving work functioning in patients with inflammatory arthritis [32]. The positive results in relation to work are not only important for the patients with chronic pain, but also for their families and society as a whole [1]. In future studies the outcome "return to work" could be one factor used to determine if an interprofessional programme is cost-effective in patients with chronic pain [33].

Furthermore, the effect on burden of suffering, evaluated with the PRISM [26] was statistically significant up to the 2-year follow-up. Similar but less clear results were obtained for EuroQol [21, 22]. Together, this indicates a reduced burden of suffering [30] and an increased general health after the BAI Reha [21, 22].

However, we did not find any evidence for an influence of the BAI Reha programme on pain intensity. These results are in line with earlier studies showing very small effects or no effect of interprofessional programmes on the intensity of pain [e.g., 9, 10], and they underline the importance of focusing on coping strategies rather than reduction of pain intensity [34]. Accordingly, our patients were encouraged to focus on their individual goals and on increasing activity and participation (e.g., sports, work) and not on reduction of pain intensity.

Performance of daily life tasks has rarely been addressed in recently published intervention studies. We found that the BAI-Reha programme had a positive effect on daily life and in particular on the self-rated quality of and satisfaction with daily life task performance. This may well be explained by the goal-directed strategy of our rehabilitation programme. In the first COPM interview [25] the patients have to define their meaningful goals for activity and participation that subsequently remain the focus of the BAI-Reha.

In agreement with this finding, BAI-Reha may also increase the quality of ADL performance measured with the AMPS [24]. However, the effect was only found for ADL motor measures, which supports earlier findings that ADL process performance did not change [35] or only minimally changed [36] during an intervention. A possible explanation is that the quality of ADL process performance is not affected in persons with chronic musculoskeletal pain. Accordingly, the mean ADL process performance measures of the participants in our study were in a normal range at the baseline evaluation. Patients with chronic pain may perform daily life tasks with increased physical effort and clumsiness (ADL motor performance) but with normal efficiency, safety and independence (ADL process performance) [35].

There are several statistical limitations of our study. Most importantly, a control group is lacking and it remains unknown to what extent time may confound the analysis. Second, the sample size of 30 is very small. Third, assessors were not independent and not blinded regarding time points of the programme. Finally, although data were collected prospectively, they were stored in patient charts and transferred into the data base at the time of analysis only, making a re-assessment of missing data impossible. Our analyses included patients with partially missing data but missing data points were excluded (see table 3). Finally, the use of return to work as a primary outcome could be questioned. In future studies other outcomes to evaluate work functioning or sickness absenteeism [2] of persons with chronic pain should be included.

In conclusion, this study confirms earlier data about a short-, medium-, and long-term effectiveness of an interprofessional rehabilitation programme, the BAI-Reha programme for patients with chronic musculoskeletal pain. It adds new knowledge about the effect on return to work, burden of suffering and quality of and satisfaction with daily life task performance.

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Conflict of interest
No other potential conflict of interest relevant to this article was reported.

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